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                PROBABILITY AND STATISTICS FOR NAVAL EXPERIMENTATION, EVALUATIO--ETC(U)
   MAR 82 R J SERFLING   N00014-76-C-0608
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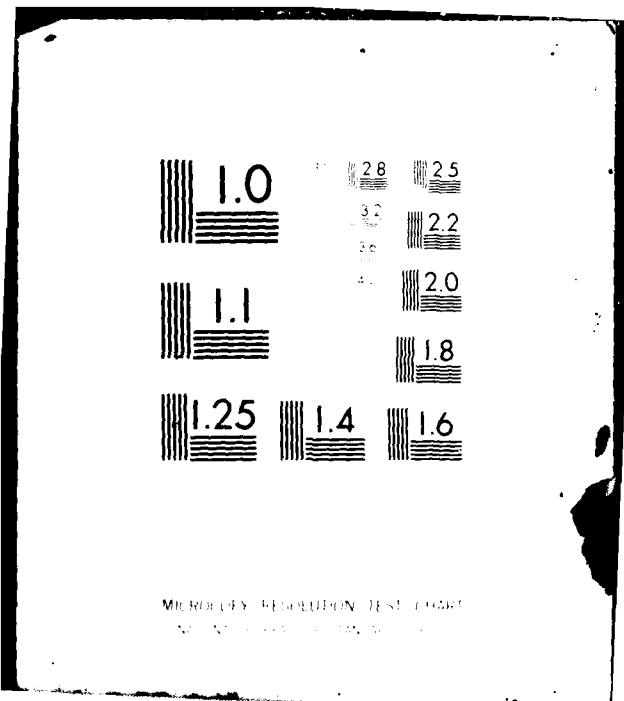
FINAL REPORT

PROBABILITY AND STATISTICS FOR NAVAL
EXPERIMENTATION, EVALUATION, AND OPERATIONS

January 1, 1976 through September 15, 1979

March 15, 1982

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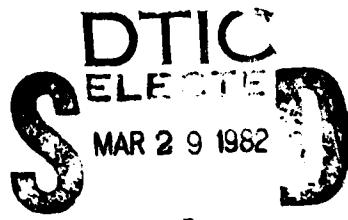
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1. Introduction

This research project was conducted under contract between the Office of Naval Research, Department of the Navy, and the Board of Regents of the State of Florida acting for the Florida State University, during the period January 1, 1976 through September 15, 1979.

The project dealt with a number of situations of random variation arising in Naval scientific experimentation, quality and reliability evaluation, and field operations. For important varieties of test statistics and estimators, the large-sample distribution theory and other convergence properties were worked out. New methodologies were developed, and the basic probability foundations were strengthened. Specifically, contributions were developed in the following areas:

- •computation of error probabilities of test statistics in goodness-of-fit problems

- •computation of confidence coefficients for confidence intervals based on robust and nonparametric estimators

- •computation of asymptotic relative efficiencies of test statistics

- •representation of complex statistics by approximate simpler forms

- •properties of differentiable statistical functions

- •properties of nonparametric density function estimators

- •properties of nonparametric regression function estimators

- •design of experiments

- •use of Poisson approximation in reliability computations

- •properties of sums of dependent variables

The technical reports produced are listed in Section 2, the publications in scholarly journals in Section 3, and the research personnel in Section 4.

2. Technical Reports

1. Longnecker, M. and Serfling, R. J., "A Note on Application of a Lemma of Billingsley," ONR Technical Report No. 103, February, 1976.

2. Serfling, R. J., "Some Elementary Results on Poisson Approximation in a Sequence of Bernoulli Trials," ONR Technical Report No. 104, April, 1976.

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5. Serfling, R. J., "On Stratification by Equal Cluster Size in Single-Stage Cluster Sampling," ONR Technical Report No. 107, May, 1976.

6. Boos, D. D. and Serfling, R. J., "Development and Comparison of M-Estimators for Location on the Basis of the Asymptotic Variance Functional," ONR Technical Report No. 108, July, 1976.

7. Longnecker, M. and Serfling, R. J., "An Annotated Bibliography of Selected References on Maximal Inequalities and Their Applications," ONR Technical Report No. 109, August, 1976.

8. El-Helbawy, A. T. and Bradley, R. A., "Treatment Contrasts in Paired Comparisons: Large-Sample Results, Applications and Some Optimal Designs," FSU Statistics Report M368, ONR Technical Report No. 102, December, 1976.

9. Kimeldorf, G. and Sampson, A. R., "Monotone Dependence," FSU Statistics Report M423, ONR Technical Report No. 120, January, 1977.

10. Longnecker, M. and Serfling, R. J., "Moment Inequalities for S_n under General Dependence Restrictions, with Applications," FSU Statistics Report M411, ONR Technical Report No. 113, May, 1977.

11. Bradley, R. A. and El-Helbawy, A. T., "Some Optimal Design Results in Paired Comparisons," FSU Statistics Report M414, ONR Technical Report No. 114, May, 1977.

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14. Serfling, R. J., "On the Berry-Esseen Theorem for Simple Linear Rank Statistics," FSU Statistics Report M425, ONR Technical Report No. 121, August, 1977.

15. Serfling, R. J., "On the Strong Law of Large Numbers and Related Results for Quasi-stationary Sequences," FSU Statistics Report M430, ONR Technical Report No. 123, August, 1977.

16. Abdel-Hameed, M. and Sampson, A. R., "Positive Dependence of the Bivariate and Trivariate Absolute Normal, t, χ^2, and F Distributions," FSU Statistics Report M431, ONR Technical Report No. 124, March, 1977.

17. Watts, V., "Asymptotic Behavior of Intermediate Order Statistics: the Infinite Endpoint Case," FSU Statistics Report M436, ONR Technical Report No. 125, October, 1977.

18. Watts, V., "The Weak Representation of Intermediate Order Statistics," FSU Statistics Report M443, ONR Technical Report No. 128, December, 1977.

19. Taylor, R. L. and Cheng, K. F., "On the Uniform Complete Convergence of Density Function Estimates," FSU Statistics Report M446, ONR Technical Report No. 129, December, 1977.

20. Bradley, R. A. and Yeh, C. M., "Trend-free Block Designs: Theory," FSU Statistics Report M453, ONR Technical Report No. 130, February, 1978.

21. Watts, V., "On the Second Moment of the Remainder Term Appearing in the Intermediate Order Statistic Representation," FSU Statistics Report M457, ONR Technica Repor No. 131, February, 1978.

22. Langberg, N. A., Johnson, R. and Bradley, R. A., "Stochastic Models for the Random Location of Individuals in a Habitat," FSU Statistics Report No. M455, ONR Technical Report No. 132, March, 1978.

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24. Serfling, R. J., "A Variation on Scheffe's Theorem, with Application to Nonparametric Density Estimation," FSU Statistics Report No. M502, ONR Technical Report No. 137, May, 1979.

25. Cheng, E. P. and Serfling, R. J., "Convergence Rates for the Mean Integrated Squared Errors of Some Nonparametric Density Estimators of Recursive δ-Function Type," FSU Statistics Report No. M505, ONR Technical Report No. 138, July, 1979.

26. Cheng, K. F. and Serfling, R. J., "On Rates of Convergence in the L_2-Norm of Nonparametric Probability Density Estimates," FSU Statistics Report No. M506, ONR Technical Report No. 139, July, 1979.

27. Cheng, K. F. and Serfling, R. J., "On Estimation of a Class of Efficacy-Related Parameters," FSU Statistics Report No. M507, ONR Technical Report No. 140, July, 1979.

28. Bradley, R. A. and Yeh, Ching-Ming, "Trend-Free Block Designs: Existence and Construction Results," FSU Statistics Report No. M508, ONR Technical Report No. 141, July, 1979.

29. Wood, Constance L. and Serfling, R. J., "Limit Distributions of Kolmogorov-Smirnov Type Statistics under a Fixed Alternative with Estimated Location and Scale Parameters," FSU Statistics Report No. M509, ONR Technical Report No. 142, July, 1979.

30. Cheng, K. F., "Strong Convergence in Nonparametric Estimation of Regression Functions," FSU Statistics Report No. M510, ONR Technical Report No. 143, July, 1979.

31. Cheng, K. F., "On Rates of Convergence of Jackknife Estimators," FSU Statistics Report No. M511, ONR Technical Report No. 144, July, 1979.

32. Cheng, K. F. and Lin, P. E., "Nonparametric Estimation of a Regression Function," FSU Statistics Report No. M512, ONR Technical Report No. 145, July, 1979.

33. Cheng, K. F., "Contributions to Nonparametric Generalized Failure Rate Function Estimation," FSU Statistics Report No. M513, ONR Technical Report No. 146, July, 1979.

34. Cheng, K. F. and Lin, P. E., "Nonparametric Estimation of a Regression Function: Limiting Distribution," FSU Statistics Report No. M518, ONR Technical Report No. 148, September, 1979.

3. Publications

1. El-Helbawy, A. T. and Bradley, R. A. (1977), "Treatment contrasts in paired comparisons: convergence of a basic iterative scheme for estimation," Commun. Statist. Th. and Meth. A 6, 197-207.

2. Longnecker, M. and Serfling, R. J. (1977), "General moment and probability inequalities for the maximum partial sum," Acta. Math. Acad. Sci. Hungar. 30, 129-133.

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4. Serfling, R. J. (1978), "Some elementary results on Poisson approximation in a sequence of Bernoulli trials," SIAM Review, 20, 567-579.

5. Bradley, R. A. and El-Helbawy, A. T. (1977), "Some optimal designs in paired comparisons," Bull. Int. Statist. Inst. 47, 92-95.

6. Longnecker, M. and Serfling, R. J. (1978), "Moment inequalities for S_n under general dependence restrictions, with applications," Z. Wahrscheinlichkeitstheorie ver. Gebiete 43, 1-21.

7. Thall, P. F. (1978), "Huber-sense robust M-estimation of a scale parameter, with application to the exponential distribution," J. Amer. Statist. Assoc. 73, 147-152.

8. Boos, Dennis D. (1979), "A differential for L-statistics," Ann. Statist. 7, 955-959.

9. Wood, C. L. (1978), "On null-hypothesis limiting distributions of Kolmogorov-Smirnov type statistics with estimated location and scale parameters," Comm. in Statist., A7 12, 1181-1198.

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17. Bradley, R. A. and Yeh. C. M. (1980), "Trend-Free Block Designs: Theory," Ann. Statist. 8, 883-893.

18. Cheng, K. F. and Serfling, R. J. (1981), "On Estimation of a Class of Efficacy-related Parameters," Scand. Act. J. 1981, 83-92.

19. Cheng, P. E. and Serfling, R. J. (1981), "Asymptotic Mean Integrated Squared Errors of Some Nonparametric Density Estimators," IEEE Trans. on Information Theory, Vol. IT-27, 239-242.

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23. Serfling, R. J. (1980), Approximation Theorems of Mathematical Statistics, John Wiley & Sons.

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20. ABSTRACT

The report describes the work accomplished and its impact on Naval programs, and lists publications and supported personnel on the project.